

SPECIAL REPORT

TRAUMATIC BRAIN INJURY CAUSED BY WORK ACCIDENTS: HOW CAN OCCUPATIONAL AND VOCATIONAL RECOVERY BE ACHIEVED?

Paola PERINI, PhD^{1,4,6}, Margherita CARISTI, M.Sci², Elisabetta MONDIN, PhD^{4,5}, Maria Rosaria MATARRESE, MD, PhD², Giovanni CORTESE, MD, PhD², Alessandro GIUSTINI, MD, PhD^{1,3,4}, Iliara CANNELLA, M.Sci², Alessia PINZELLO, M.Sci² and Paolo FOGAR, M.Sci⁴

¹Istituto di Riabilitazione Madre della Divina Provvidenza Agazzi, Arezzo, Italy

²INAIL Istituto Nazionale Assicurazione Infortuni sul lavoro, Direzione Centrale, Roma, Italy

³Ospedale Di Riabilitazione San Pancrazio Arco di Trento, Arco, Italy

⁴FNATC, Federazione Nazionale Traumi Cranici, Pordenone, Italy

⁵Sogno e Vita Cooperativa Sociale, Vicenza, Italy

⁶Associazione Casa e Lavoro APS, Ferrara, Italy

Issues connected with the reintegration of individuals affected by severe brain injury are numerous and complex. Extensive data indicate the effectiveness of treatments based on an holistic approach, which integrates medical interventions with social programmes and offers continuity, leading to the rapid achievement of independent living outcomes and return to work. In Italy, extensive resources are available for the clinical and rehabilitation management of individuals affected by traumatic brain injury in the acute and post-acute phase, but there are only a few organized services to support the reintegration phase. This paper describes a model created via a 2-year collaboration between the National Institute for Insurance against Accidents at Work (INAIL) in Rome and the National Federation of Traumatic Brain Injury Associations (FNATC). The combined effort of these organizations led to the development of an Italian Model of Vocational Rehabilitation (IMoVR), which was exportable to all 20 Italian Regions. Due to the experience gained by a few avant-garde teams, IMoVR was used to pioneer an approach characterized by structured phases and actions aimed at designing high-quality interventions, and at monitoring their long-term effectiveness. These teams comprised experts in different areas, including: forensic doctors, social workers, administrative managers of INAIL, neuropsychologists, psychotherapists, educators working in associations registered with FNATC, all of whom are members of a service network that had already activated small individual vocational projects. In total, the collaboration comprised 42 pro-

LAY ABSTRACT

Traumatic brain injury caused by work accidents: how can occupational and vocational recovery be achieved? Issues connected with the reintegration of individuals affected by severe brain injury are numerous and highly complex, involving sensorimotor, cognitive, psychological and behavioural factors and requiring specific interventions throughout many years. This paper describes a Model created through a two-year collaboration between the National Institute for Insurance against Accidents at Work (INAIL) and the National Federation of Traumatic Brain Injury Associations (FNATC). Their conjoined effort led to the development of an Italian Model of Vocational Rehabilitation (IMoVR) exportable to all 20 Italian regions. Thanks to the experience built by few avantgarde teams, this Model represents an absolute first-ever innovation in Italy, characterized by structured phases and actions aimed at designing high quality intervention and at monitoring their long-term effectiveness.

professionals working in 7 Italian cities: Ancona, Arezzo, Ferrara, Milano, Pordenone, Rimini and Vicenza.

Key words: traumatic brain injury; return to work, vocational rehabilitation.

Accepted Jan 28, 2020; Published Mar 18, 2020

JRM-CC 2020; 3: 1000031

Correspondence address: Paola Perini, Istituto di Riabilitazione Madre della Divina Provvidenza Agazzi, Arezzo, Italy. E-mail: pperini@istitutoagazzi.it

Issues connected with the reintegration of individuals affected by severe brain injury are numerous and highly complex, involving sensorimotor, cognitive, psychological and behavioural factors, and requiring specific interventions throughout the entire rehabilitation process, from the acute phase to the long-term outcome phase. The literature shows that cognitive/behavioural problems, in particular, limit reintegration into social, school and work environments, and significantly increase the level of family stress. Therefore, people with brain injury require medium- and long-term rehabilitation and reintegration programmes, with the main objective of recovering social, family and work roles.

Recent reviews of follow-up studies (1–5) and a consensus conference (6) on this topic have highlighted the need for: (i) early interventions, (ii) family support, (iii) development of specific rehabilitation programmes (motor, cognitive, behavioural and psychotherapeutic), and (iv) implementation of support programmes for return to work and social reintegration. In their review, Wiart et al. (1) state that, despite the low levels of proof, an holistic approach, structured into programmes of cognitive-behavioural, family and systemic therapy, is recommended in the first place for all stages of TBI rehabilitation. Relational and adaptive approaches, rehabilitation and vocational approaches, and psychoanalytical therapies may be useful, provided that the therapists are familiar with and trained in TBI.

Extensive data show the effectiveness of providing treatments based on an holistic approach during the rehabilitation process. Such treatments should be targeted at integrating medical interventions with holistic programmes, including cognitive pragmatic treatment, ensuring continuity towards the rapid achievement of relational skills, independent living and return to work (7–9).

In addition, most reviews emphasize that there are no high-level evidence-based methods for vocational rehabilitation; thus, further studies are needed. Saltychev et al. (10) asserted that there is a need for well-conducted experimental and observational studies on vocational outcome. He encouraged researchers to use unified and standardized terms and scales in further studies, and suggested the International Classification of Functioning, Disability, and Health (ICF) as the best tool for this purpose (10, 11).

In several Anglo-Saxon and North American countries (12–13) well-structured rehabilitation programmes and continuity of care, extending from the hospital phase to social reintegration, are provided. According to Fadyl & McPhersson. (2), there are 3 different approaches: centre-based vocational programmes (holistic), supported employment, and case coordinated models. a review of current best-practice in TBI rehabilitation is provided by Ponsford et al. in the second edition of the book *Traumatic Brain Injury, Rehabilitation for Everyday Adaptive Living* (14).

In Italy, however, well-structured frameworks of care are, unfortunately, very rare: the first model in use in Italy, and the only one of its kind, was described in a recent paper (5), despite the fact that Italy ratified and enacted the United Nations Convention on the Rights of Persons with

Disabilities, together with the related optional Protocol (15), expressing a strong focus on the implementation of international regulations, with Law 18 on 3 March 2009, in line with the EU regulations on the subject. Extensive resources are available in Italy for the clinical and rehabilitation management of individuals affected by TBI in the acute and post-acute phase, but there are only sporadic organized services to support the rehabilitation of the long-term effects of TBI in the reintegration phase. This is due to many different factors, such as considerable gaps in community services networks throughout the country, a lack of national guidelines, and insufficient funding provided by the national health system. In addition, health is the responsibility of the Italian State, whilst social services are the responsibility of the individual Regions, which has resulted in significant discrepancies and disparities in provision of healthcare and social services, as well as in models of welfare organization across the Regions. In order to respond to the great need for social and occupational reintegration of people with TBI, a collaboration between the National Institute for Insurance against Accidents at Work (INAIL) and the National Federation of Traumatic Brain Injury Associations (FNATC) was set up. The combined efforts of these organizations led to the development of the Italian Model of Vocational Rehabilitation (IMoVR).

AIMS of Italian Model of Vocational Rehabilitation

- To offer a tool for the management of subjects with work-related TBI that ensures continuity of care and assistance, from the hospitalization phase to return to normal life.
- To provide support to multidisciplinary teams during needs assessment and response preparation for personalized vocational rehabilitation, at the regional level.
- To adopt standard assessment tools for personalized programmes during all phases of vocational rehabilitation programmes.
- To provide operational guidelines to develop standard vocational rehabilitation services throughout the Italian Regions.

Cultural context and main characteristics of Italian Model of Vocational Rehabilitation

In Italy, one of the driving forces behind this positive medical/scientific process is the increasing demand from families for social protection, improved patient welfare, and provision of voluntary organizations to help them negotiate the medical/scientific world and health and social security policies. Indeed, various local family and voluntary associations have been established, which have promoted improvements in the level of treatment and care, as well as the creation of innovative and specialized services, which are often experimental, aimed at providing support for specific problems for individuals with acquired brain injury. This support includes dedicated programmes of home care for people in minimally conscious or vegetative states, information and support services for

families and caregivers, occupational laboratories, residential centres, and group homes. One expression of this movement is the National Federation of Traumatic Brain Injury Associations, which operates at the national level as a qualified point of reference for families regarding activities supporting rehabilitation, social and work reintegration for people with TBI, and assistance interventions.

FNATC aims to:

- Act as an interlocutor with government and institutional bodies (e.g. INAIL), trying to unify the initiatives of different entities, non-profit and voluntary organizations, which provide assistance to individuals and families affected by severe acquired brain injury.
- Include 21 voluntary associations that provide services within their Regions and operate across the various phases of rehabilitation.
- Provide support and information to family members in the acute and post-acute phases.
- Meeting as opportunity to share experience, to have an holiday together people (TBI people and their family). Association create opportunity, association are founded and made by the family members.
- Create vocational rehabilitation services and co-housing opportunities out of the family system.

INAIL is a public institution that provides assistance and services to workers who are injured or contract diseases caused by their work activities. INAIL aims to:

- Evaluate damage.
- Pay compensation.
- Offer protection, which has also become increasingly comprehensive and integrated, on the basis of the concept of recovery of the mental and physical integrity of the victim of the work accident, within the context of the “Regulations for the provision of technical equipment and support interventions for reintegration in social life”(16). This involves rehabilitation and reintegration interventions aimed at repairing the damage to the health of workers by using interventions:
- Defined as part of a personalized project.
- Developed by a multidisciplinary team at the institute’s regional headquarters.
- Activated by local networks, such as cooperatives and local farms, rehabilitation centres, sports clubs.
- Fulfil specific responsibilities concerning work inclusion (17), which are implemented through financing employers for individualized projects aimed at holding job positions or assisting in the search for new employment, educational interventions for professional retraining, projects for the elimination of architectural barriers in the workplace, and adaptation of work stations for brain-injured victims of work accidents.

The IMoVR, in accordance with the present conceptual framework and current legislation, and by the use of a biological/psycho/social paradigm, has identified the

environmental context as a decisive element in disability. It calls for the development of holistic and systemic treatments, based on multidisciplinary, individualized and integrated services, provided by all parties involved in care design and provision. Concerning this point, Vestri et al. have shown that the use of designated staff members to manage therapy services improves the efficiency and efficacy of a patient-centred healthcare system (18).

The IMoVR aims to outline a shared programme founded on proven practices, which implement the recommendations from the literature and findings from reviews on rehabilitation and interventions during the post-acute and long-term phases. The objective is to provide a national level tool that ensures continuity of care and assistance, from the hospital phase to return to regular life, as well as the creation of effective programmes for vocational rehabilitation and work reintegration for individuals affected by TBI at work.

This operational method also aims at providing practical responses to the needs of family members of people with TBI. These patients, as reported in the literature, require continuous care and psychological support to recover their skills following hospital discharge; they need a job that facilitates integration into society, and also need to enjoy social activities. Families, too, need accurate and timely information on all phases of care and rehabilitation of their relatives; they need services and professionals specifically equipped to assist them in the expression and processing of their emotions, as well as interventions targeted at supporting their resilience, consultations on the re-organization of family roles and on the management of problems related to behavioural disturbances (19–23).

At the national level, numerous medical/scientific initiatives have been developed over the last decade, as well as some aimed at regulatory, social and cultural support for the problems arising from TBI, in order to define appropriate rehabilitation programmes from the acute phase to the fullest possible functional recovery of the individual. In particular, in order to contextualize international studies within the social and political situation in Italy, and to identify valid and nationally applicable findings, 3 consensus conferences were held to outline operational guidelines defined by specific panels for each rehabilitation phase: acute (24), post-acute (25), and long-term outcomes (6).

We found that planning an individual vocational rehabilitation programme depends on certain preconditions. Unfortunately, data from a previous survey of INAIL and FNATC offices suggested that very few local communities have a specific integrated network of TBI services. Only a few cities proved to be excellent providers of an efficient network between rehabilitation hospital, social services, work agencies, and other very important actors in the Italian welfare system, such as social cooperatives and voluntary associations.

Development of Italian Model of Vocational Rehabilitation

INAIL is responsible for planning and financing services in Italy for people with brain-injuries caused by work

accidents. FNATC, the National Federation of family associations, interacts with government bodies regarding the protection of the rights of people with TBI. This type of collaboration is new in Italy, and represents a strong example of participatory welfare. IMoVR was created from the analysis of international scientific evidence and the reflective analysis of experiences gathered by different regional INAIL and FNATC sites supporting the mental/physical recovery, social and work reintegration of patients with TBI and their families. This work lasted approximately 30 months and included several activities run by the authors, involving 30 people working as INAIL and FNATC volunteers.

This project focused on the analysis of rehabilitation outcomes, by breaking down the vocational rehabilitation programme into different steps and analysing, for each step, the operational tools, the professionals involved, strengths and weaknesses. Thus, data regarding experiences at regional INAIL headquarters and activities of participating FNATC associations were taken into account.

In particular the authors:

- analysed the existing models in the literature;
- surveyed projects activated by different INAIL headquarters, which were far fewer than expected despite national legislation and funding;
- surveyed the activities of the 24 FNATC associations, especially services in favour of affected families and the professionals involved. Significant heterogeneity was noted in service provision by different FNATC associations. This could be interpreted as local attempts to respond to at least some of the many needs of people living with TBI and their relatives;
- collected INAIL and FNATC associations good practices from avant-garde projects in 6 cities in Central and Northern Italy (Ancona, Arezzo, Ferrara, Pordenone, Rimini, and Vicenza).

Following this assessment and analysis, the phases and inclusion criteria for the IMoVR model were set out.

Description of Italian Model of Vocational Rehabilitation

People with TBI caused by a work accident, who are eligible for individual IMoVR programmes include individuals aged 16–65 years, male or female, who have acquired disability, and cannot return to their previous employment or need professional retraining. People who cannot return to competitive jobs, but who need a meaningful occupation (e.g. non-competitive employment or voluntary work) are also eligible. Finally, people who want to improve their activities of daily living and social reintegration should be included. There should be no limits to entry to IMoVR dictated by motor problems, while, for cognitive and behavioural aspects, a classification of level 6 or more on the LCF scale is required (26) at the time of entry to the vocational rehabilitation programme.

The following brief extract from the LCF scale sets out the cognitive level for inclusion:

- *Not eligible: Level IV* – Confused, Agitated Response.
- Patient exhibits bizarre, non-purposeful, incoherent or inappropriate behaviours, has no short term recall, attention is short and non-selective.
- *Not eligible: Level V* – Confused, Inappropriate, Non-agitated Response.
- Patient gives random, fragmented, and non-purposeful responses to complex or unstructured stimuli. Simple commands are followed consistently, memory and selective attention are impaired, and new information is not retained.
- *Eligible: Level VI* – Confused, Appropriate Response.
- Patient gives context-appropriate, goal-directed responses, dependent upon external input for direction. There is carry-over for relearning, but not for new tasks, and recent memory problems persist.
- *Eligible: Level VII* – Automatic, Appropriate Response.
- Patient behaves appropriately in familiar settings, performs daily routines automatically, and shows carry-over for new learning at lower than normal rates. Patient initiates social interactions, but judgement remains impaired.
- *Eligible: Level VIII* – Purposeful, Appropriate Response.
- Patient is oriented and responds to the environment, but abstract reasoning abilities are decreased relative to premorbid levels.

Data from previous experience suggest that the essential prerequisites for appropriate design of a vocational rehabilitation programme includes having already established synergies with hospital facilities, rehabilitation centres, and community social and third-sector services, since these facilitate prompt reporting of cases, integration and continuity of management processes and increased variety and quality of service provision.

Stages in Italian Model of Vocational Rehabilitation

1. Collection and analysis of clinical history and documentation, with a special focus on neuropsychological assessment. The team that designs the individualized project must be able to read and *fully understand* the neuropsychological assessment and its meaning, being capable of understanding the complete range of consequences of neuropsychological deficiencies on a person's daily life and work. In this regard, Functional Assessment Scales are very useful assessment tools. Unfortunately, however, they are not always included in the patients' clinical files provided by rehabilitation departments in Italy.
2. Assessment of the individual social, family and work situation, and related needs assessment.
3. Intervention project. An individualized project must include short- and medium-term goals, activities, professional care providers involved, costs, expected results, and result evaluation tools.

4. Ongoing evaluation.
5. Outcome evaluation. Data analysis by the use of evaluation tools.
6. Project fine-tuning or new planning.
7. Follow-up.

If these stages are respected, comparable data can be collected (11) to assess the benefits of the vocational rehabilitation path, which is poorly studied as remarked in some systematic review and retrospective studies (10–27).

Due to the huge differences between local realities that emerged from our survey, and the absence of national operational guidelines, IMoVR consists of short and simple sentences that include a range of free choices for users, in compliance with local peculiarities.

However, we considered it essential to integrate the model with considerations arising from an extended “workgroup on good practice”. We invited PhD researchers, social workers, neuropsychologists, psychotherapists, and volunteers from the 7 cities mentioned above, to combine their daily experience. Based on their work we have a wealth of considerations.

RESULTS OF WORKGROUP ON GOOD PRACTICE

For each of the stages of IMoVR, several aspects were described and elaborated by the workgroup on good practice. These aspects have been enclosed in 4 conceptual categories: operational tools, professional roles, strengths, and critical issues. They include and describe many different aspects: the possibility of consulting professionals who are experts in TBI; the presence of ideas for protocols for case evaluation and information exchange that permit a more comprehensive understanding of medium- and long-term needs; the adoption of validated and shared tools to assess individual functioning and performance; the need to involve third-sector organizations.

These aspects are described and examined in depth in the **Appendix 1**, which stems from the work of 42 experts who have tried to summarize their daily experiences in these nouns (see Appendix I for the complete elaboration written for the workgroup during the meeting). The professionals involved in each step are detailed, as well as their relevance, in order to stress the importance of multi-professional teams without losing sight of the goal. The greatest risk of inter-company teams is waste of time and waste of resources. Effective sharing of management provides the opportunity to change long-term services for TBI in Italy.

Stages of Model of Vocational Rehabilitation and extracts from Appendix 1

- *Prerequisites and weaknesses*

Prerequisites: the existence of a TBINet a network of contacts and collaborations between neuro-rehabili-

tation teams, INAIL services and local community (associations, cooperatives, social service).

Weaknesses are: a lack of formal collaborations within the TBINet, lack of protocols, or a lack of multidisciplinary teams with clear roles and responsibility.

Continuity and sharing of management between hospitals, INAIL and social services are necessary in vocational and social re-integration processes for people with TBI in Italian services.

- *Collection and analysis of clinical documentation*

In order to gain a more complete understanding of the case during the analysis of the application, an examination of the specific phases highlighted a need for effective and integrated case-reporting tools, complete medical documentation, and the possibility to create collaborations between rehabilitation teams and the INAIL regional teams. The involvement of family members and social services in specific skills for TBI recovery are strong points in this phase, while delays in patients taking charge and a lack of common language (TBI culture) in the TBINet are weaknesses.

- *Assessment*

Strengths in analysis of the personal and social/family situation include the use of specific evaluation tools (scales and questionnaires for TBI, functional evaluations, ICF classification, and autobiographical narration). Sharing of useful elements for case assessment within TBINet components, and the provision of assessment feedback to the patient and his/her family are other valid points. Strengths are the active participation of the person with TBI and their families in action planning, and shared information within TBINet.

By contrast, the fragmentation of assistance and programmes is a weakness, as well as the gap between support requests and responses from local service providers.

- *Intervention project*

In the project design process, it is critical to share the project proposal with local services, in order to avoid overlaps or gaps in assistance, as well as to involve the industries, cooperatives, and associations in creating practical and shared conditions for work reintegration. Again, the use of ICF indicators is recommended for project evaluation, the creation of a TBINet shared project (co-planning from the hospital discharge phase) and the sharing of resources. Of great importance is the possibility of having enough time to vocational rehabilitation, not only to competitive jobs, but also to promote independence and awareness; especially when the person with TBI has significant functional impairment and activity limitations caused by complexity, there is a need for very gradual development.

A critical aspect is the lack of occupational laboratories and dedicated programmes targeted at work

reintegration of people living with TBI, and the lack of awareness among employers and the local production sector.

- *Ongoing evaluation*

When performed by the professional in charge of the case, ongoing evaluation is highly useful to ensure the appropriateness of interventions over time, as well as the continuity of support. INAIL can verify through interviews, home visits, telephone calls with the patient and family, in order to produce a progress report and programme a follow-up meeting between partner organizations: the whole TBINet or part of it. A useful resource is the continuity of support from INAIL teams for people with TBI and their relatives. This information must be transmitted to TBINet in order to not lose resources.

- *Outcome assessment*

Outcome assessment is an essential stage in the possible fine-tuning of the project; however, outcome assessment still needs improvement. A lack of common standardized assessment tools among service providers, and poor dedicated tools for assistance provision programmes for patients with TBI and their families in INAIL Regional Services are still points of weakness. A final report, including evaluation of satisfaction with vocational programmes, should be prepared and shared with TBINet and the family. The final outcome also depends on the opportunities the area offers for competitive employment, occupation and voluntary work. The presence in the area of associations and cooperatives specialized in opportunities for people with TBI greatly facilitates the creation of virtuous outcomes.

- *Follow-up*

In Italy the follow-up phase, which is essential for measuring the persistence of project outcomes over time and the possible need for new interventions, is currently poorly developed and not organized. This stage could also create easy access to express new needs for the patient and family. In addition, it is necessary to collect data about the outcomes achieved and their persistence over time.

DISCUSSION

Regarding work reintegration, the literature includes studies that lead to the identification of factors that facilitate or hinder return to work and reintegration into the social environment, such as the severity of trauma (Glasgow Coma Scale; GCS), duration of hospitalization, sex, employment prior to the traumatic event, level of education, and the timeliness and intensity of the intervention (28–35). IMoVR aims to create timely and intensive intervention, from the hospital to the reintegration phase. First of all, it provides for the need to create TBINet, through formal agreements between different services, so that people living with TBI and

their relatives can be guided by TBINet and do not have to fight for their entitlements.

One of the main factors ensuring quality in this vocational rehabilitation model is compliance with the 7 stages of management described above. Retrospective studies (10, 27) are more reliable when the criteria to be analysed are well defined. We are confident that the IMoVR methodology and model described here will be useful, not only in providing an historical context for people to refer to when developing interventions, but also as a tool that allows uniform data collection. It is hoped that this work will also contribute to the clinical research necessary for evidence-based rehabilitation, as indicated by the Cochrane Review on this subject (36).

To date, INAIL has planned numerous individualized projects for its beneficiaries. But, until now, the lack of a shared language and models has not enabled the collection of data about the efficacy and efficiency of the rehabilitation pathway. If the use of IMoVR was implemented in every individual INAIL project, in 5 years' time it should be possible to collect useful data. The authors' hope is to demonstrate statistically what the rehabilitation providers observe everyday, thus helping in making medical rehabilitation more effective, and enabling people affected by TBI and their families to optimize their social and work reintegration, and improve their quality of life.

Regarding the methodology, the high-quality elements of IMoVR include: involvement of the family, adoption of the biological/psychological/social paradigm as a frame of reference, the definition of continuous interventions between medical rehabilitation and social-work reintegration, and the creation of a local specialized network (TBINet) for intervention planning and implementation.

In Italy there are services dedicated to inclusion and work for congenitally disabled people, but very few for people with TBI (5). IMoVR aims to create a wider culture of inclusion of TBI in social service, cooperatives and other local service providers. IMoVR deepens and addresses specific and different aspects of Brain injury in order to provide a more comprehensive management process capable of meeting patients' and caregivers' needs. IMoVR shows that professional interventions need to include psychological and neuropsychological support and other experts in TBI, as well as skilled occupational laboratories and the possibility of implementing programmes dedicated to work reintegration.

Conclusion

Thanks to this collaboration between INAIL and FNATC, IMoVR is the first example in Italy of a public insurance service conceived and implemented with the direct contribution of family members. The IMoVR model is:

- Clear and simple, and therefore repeatable and adaptable to every Italian province.
- A path conceived and coordinated by the author who, however, used the knowledge of more than 40 experts and family members in a bottom up process.

For the future, INAIL and FNATC intend to share this model nationally in Italy, via awareness campaigns for families and training for operators to create more vocational rehabilitation experts, thus establishing TBINet in every province. Another primary goal will be to collect data for the Vocational Rehabilitation Individual Project (outcome/cost/effect), in order to evaluate the efficiency and efficacy of a TBI-patients-centred healthcare system in the outcome phase.

REFERENCES

1. Wiart L, Luauté J, Stefan A, Plantier D, Hamonet J. Non pharmacological treatments for psychological and behavioral disorders following traumatic brain injury (TBI). A systematic literature review and expert opinion leading to recommendations. *Arch Phys Med Rehabil* 2016; 59: 31–41.
2. Fadyl JK, McPherson KM. Approaches to vocational rehabilitation after traumatic brain injury: a review of the evidence. *J Head Trauma Rehabil* 2009; 24 3: 195–212.
3. Cattelani R, Zettin M, Zoccolotti P. Rehabilitation treatments for adults with behavioral and psychosocial disorders following acquired brain injury: a systematic review. *Neuropsychol Rev* 2010; 20: 52–85.
4. Kumar KS, Samuelkamaleshkumar S, Viswanathan A, Macaden AS. Cognitive rehabilitation for adults with traumatic brain injury to improve occupational outcomes. *Cochrane Database Syst Rev* 2017; 6: CD007935.
5. Perini P, Rossi G, Testa A, Giustini A, Tosi L. Vocational rehabilitation in Italy, potential and limits. *Int J Phys Med Rehabil* 2018; 6: 6.
6. Apollone G, Boldrini P, Avesani R, De Tanti A, Fogar P, Gambini MG, et al. [Second consensus conference: the rehabilitation and care needs of people with acquired brain injury and their family] *Ital J Rehab Med* 2007; 21: 29–51 (in Italian).
7. Keiji H, Takatsugu O, Shu W, Masahiro O. Effectiveness of comprehensive day treatment program for rehabilitation of patients with acquired brain injury. *J Rehabil Med* 2006; 38: 20–25.
8. Ben Yishai Y. Postacute neuropsychological rehabilitation, a holistic prospective. In: *International Handbook of Neuropsychological Rehabilitation*. New York: Kluwer Academic Plenum Publisher; 2000, p.131–139.
9. Gabbatore I, Sacco K, Angeleri R, Zettin M, Bara BG, Bosco FM. Cognitive pragmatic treatment: a rehabilitative program for traumatic brain injury individuals *J Head Trauma Rehabil* 2015; 5: E14–E28.
10. Salytchev M, Eskola M, Tenovu O, Laimi K. Return to work after traumatic brain injury: systematic review. *Brain Inj* 2013; 27: 1516–1527.
11. World Health Organization. *International Classification of Functioning, Disability and Health (ICF)*. Trento: Erickson; 2002.
12. Tyerman A. Vocational rehabilitation after traumatic brain injury: models and services. *NeuroRehabilitation* 2012; 31: 51–62.
13. Malec JF. Impact of comprehensive day treatment on societal participation for persons with acquired brain injury. *Arch Phys Med Rehabil* 2001; 82: 885–889.
14. Ponsford J, Sloan J, Snow P. *Traumatic brain injury – rehabilitation for everyday adaptive living*. 2nd edn. New York: Psychology Press; 2013.
15. UN Convention on the Rights of Persons with Disabilities. New-York:United Nations; 2006. Available from: <https://www.un.org/disabilities/documents/convention/convoptprot-e.pdf> and in Italian <https://www.lavoro.gov.it/temi-e-priorita/disabilita-e-non-autosufficienza/focus-on/Convenzione%20ONU.pdf>.
16. Official Bulletin of Italian Ministry of Economics and Finance. Rome; 2000. Legislative Decree no. 38/2000. Available from: <https://www.gazzettaufficiale.it/eli/id/2000/03/20/000A3221/sg> (in Italian).
17. Official Bulletin of Italian Ministry of Economics and Finance. Rome; 2014. Law no. 190/2014, Art. 1, comma 166. <https://cliclavoro.gov.it/normative/legge23dicembre2014n.190.pdf> in Italian comma 166 a pag. 86 (in Italian).
18. Vetri A, Pizzighello S, Piccoli S, Martinuzzi A. Benefits of centralized scheduling in a postacute residential rehabilitation program for people with acquired brain lesions: a pilot study. *Arch Phys Med Rehabil* 2017; 98: 746–750.
19. Lundqvist A, Samuelsson K. Return to work after acquired brain injury: a patient perspective. *Brain Inj* 2012; 26: 1574–1585.
20. Kreutzer JS, Marwitz JH, Sima AP, Bergquist TF, Johnson-Greene D, Felix ER et al. Resilience following traumatic brain injury: a model systems study. *Arch Phys Med Rehabil* 2016; 97: 708–713.
21. Corrigan, JD, Whiteneck G, Mellick D. Perceived needs following traumatic brain injury. *J Head Trauma Rehabil* 2004; 19: 205–216.
22. Kreutzer JS, Marwitz JH, Godwin EE, Arango-Lasprilla JC. Practical approaches to effective family intervention after brain injury. *J Head Trauma Rehabil* 2010; 25: 113–120.
23. Niemer JP, Kreutzer JS, Marwitz JH, Sima AP. A randomized controlled pilot study of a manualized intervention for caregivers of patients with traumatic brain injury in inpatient rehabilitation. *Arch Phys Med Rehabil* 2019; 100: S65–S75.
24. Taricco M, De Tanti A, Boldrini P, Gatta G. The rehabilitation management of traumatic brain injury patients during the acute phase: criteria for referral and transfer from intensive care units to rehabilitative facilities. *Eur Medicophys* 2006; 42: 73–84.
25. De Tanti A, Zampolini M, Pregno S. Recommendations for clinical practice and research in severe brain injury in intensive rehabilitation: the Italian Consensus Conference. *Eur J Phys Rehabil Med* 2015; 51: 89–103.
26. Hagen C, Malkmuss D, Durham P. *Rancho Los Amigos – Levels of cognitive functioning*. Downey, CA: Rancho Los Amigos Hospital; 1972. Available from: http://www.coma.ulg.ac.be/images/levels_cogfunc.pdf.
27. Bonneterre M, Perennou D, Trovatiello V, Mignot N, Segal P, Balducci F, et al. Interest of workplace support for returning to work after a traumatic brain injury: a retrospective study. *Ann Phys Rehabil Med* 2013; 56: 652–662.
28. He Y, Hu J, Sun Yu I, Gu W, Liang W. Determinants of return to work after occupational injury. *J Occup Rehabil* 2010; 20: 378–386.
29. Bjo Rkdahl A. The return to work after a neuropsychological programme and prognostic factors for success. *Brain Inj* 2010; 24: 1061–1069.
30. Grauwmeijer E, Heijenbrok-Kal MH, Haitsma IK, Ribbers GM. A prospective study on employment outcome 3 years after moderate to severe traumatic brain injury. *Arch Phys Med Rehabil* 2012; 93: 993–999.
31. Lexell J, Whilney A, Jacobsson LJ. Vocational outcome 6–15 years after a traumatic brain injury. *Brain Inj* 2016; 1: 1–6.
32. Scaratti C, Leonardi M, Sattin D, Schiavolin S, Willems M, Raggi A. Work-related difficulties in patients with traumatic brain injury: a systematic review on predictors and associated factors. *Disabil Rehabil* 2017; 39: 847–855.
33. Grauwmeijer E, Heijenbrok-Kal M, Haitsma IK, Ribbers G. Employment outcome ten years after moderate to severe traumatic brain injury: a prospective cohort study. *J Neurotrauma* 2017; 34: 2575–2581.
34. West MD, Targett PS, Crockatt SY, Wehman PH. Return to work following traumatic brain injury. In: Zasler ND, Katz DI, Zafonte RD, editors. *Brain injury medicine – principles and practice*. New York: Demos Medical Publishing; 2012, pp. 1349–1359.
35. Stergiou-Kita M, Dawson D, Rappolt S. Inter-professional clinical practice guidelines for vocational evaluation following traumatic brain injury: a systematic and evidence-based approach. *J Occup Rehabil* 2012; 22: 166–181.
36. Turner-Stokes L, Pick A, Nair A, Disler PB, Wade DT. Multi-disciplinary rehabilitation for acquired brain injury in adults of working age. *Cochrane Database of Syst Rev* 2015; (3): CD004170.

Appendix 1. Working group on good practice report

Operational tools	Professional roles involved	Strengths	Weaknesses
<i>Pre-requisites</i>			
<ul style="list-style-type: none"> - Maps of social and health services within the region - Multidisciplinary teams of TBINet providing established collaborations on cases, informal/formal collaborations through protocols and agreements - Joint interviews, joint home visits, hospital access by INAIL team - Tools in use at hospital level (pre-discharge form, aid plan, etc.) 	<ul style="list-style-type: none"> - INAIL 1st level multidisciplinary team - Local INAIL social worker (filter role, link, and connection with the TBINet) - Neuro-rehabilitation team - INAIL regional services team 	<ul style="list-style-type: none"> - Timeliness in reporting cases: from hospital to home - Timeliness, continuity and sharing of management between hospital and INAIL - Integration of interventions and services within TBINet - Available TBI expertise 	<ul style="list-style-type: none"> - Lack of formal collaborations between TBINet - Lack of protocol for case notification - Lack of staff - Lack of clarity regarding different service boundaries, roles and responsibility within TBINet
<i>Collection and analysis of clinical documentation</i>			
<ul style="list-style-type: none"> - INAIL internal notification channels - Health and social files - Interviews with patients and their family members by INAIL professional team - Meetings with the regional team and cooperation among INAIL professionals 	<ul style="list-style-type: none"> - INAIL 1st level multidisciplinary team - Hospital team/rehabilitation team - Local social service 	<ul style="list-style-type: none"> - Timelines of management - Multidisciplinary approach (different expertise and points of view) - Availability of an effective TBINet INAIL internal planning support - Specific skills in TBI recovery 	<ul style="list-style-type: none"> - Lack of a shared post-discharge management programme within the TBINet - Delays in patients' taking charge - Little/no common language (TBI culture) within the TBINet
<i>Assessment</i>			
<ul style="list-style-type: none"> - Interviews with family members/patients/ service providers - Hospital and home visits - Social reports or other professional reports - Use of tools for autobiographical narration - Use of scales and questionnaires, e.g. quality of life assessment for patients and caregivers, or Primary and Secondary ADL Scale, or Community Integration Scale - Returning an assessment feedback to the patient and family members 	<ul style="list-style-type: none"> - Local social worker with social report - INAIL local team - Multidimensional needs assessment by INAIL - 1st level (hospital) multidisciplinary team neuropsychological report 	<ul style="list-style-type: none"> - Information and elements of assessment sharing - Shared research on resources to activate: local service providers - Sense of safety during planning - Active participation of patients and family members 	<ul style="list-style-type: none"> - Interventions fragmentation - Erratic use of the ICF form - Gap between support requests and response from local service providers
<i>Intervention project</i>			
<ul style="list-style-type: none"> - Team meetings with the different local services involved to share the programme proposal - Sharing the project with the patient and family - Recommended use of ICF indicators for project evaluation 	<ul style="list-style-type: none"> - INAIL local multidisciplinary team - A representant of hospital neurerehabilitation team 	<ul style="list-style-type: none"> - Creation of a TBINet shared project (co- planning since the hospital discharge phase) - Sharing of resources - Timeliness, continuity and progressive nature of interventions - Local availability of service resources and opportunities 	<ul style="list-style-type: none"> - Difficulties in building project remain, if the TBI person has significant functional impairment and limitations of activities (complexity, uncertainty, need for a gradual development) - Lack of occupational laboratories and dedicated programmes targeted at work reintegration of people living with TBI - Long and cumbersome bureaucratic and administrative factors - Risk of intervention overlapping between local and INAIL service - Difficult integration of standards/regulations and responsibilities between different INAIL services - Lack of awareness by employers and the local production sector
<i>Ongoing evaluation</i>			
<ul style="list-style-type: none"> - INAIL verifications through interviews, home-visits, telephone calls with the patient and family members - Exchange of progress reports and follow-up meetings between partner organizations: the whole TBINet or part of it, depending on the individual project 	<ul style="list-style-type: none"> - INAIL social worker and multidisciplinary team - Professionals of local service providers - People living with TBI and their relatives 	<ul style="list-style-type: none"> - Continuity of support activities from INAIL team - Ensuring the appropriateness of interventions - Multidisciplinary work 	<ul style="list-style-type: none"> - Lack of shared evaluation tools
<i>Outcome assessment</i>			
<ul style="list-style-type: none"> - Meetings and/or home visits with the patient and family members by INAIL team - Meetings between INAIL team and local providers to create final reports on outcomes - The final report to be provided to the person and his caregiver - Patient and family satisfaction measuring tools to be included in the final report 	<ul style="list-style-type: none"> - INAIL social worker - INAIL multidisciplinary team - Professionals (and volunteers if any) from local providers 	<ul style="list-style-type: none"> - TBINet Collaboration - Timely fine-tuning of the project when necessary 	<ul style="list-style-type: none"> - Lack of standardized evaluation tools for INAIL regional services - Difficulty in sharing the outcomes assessment within TBINet services - Risk of not partial failure due to lack of opportunities for competitive employment, occupation and voluntary work
<i>Follow-up</i>			
<ul style="list-style-type: none"> - Planned interviews and administration of evaluation scales previously administered to patients and family members after the completion of the project (6 months, 1 year, 5 years...) 	<ul style="list-style-type: none"> - INAIL social worker 	<ul style="list-style-type: none"> - Easy availability for the patient and family in case of the above needs - Possibility of data review about the outcomes achieved and their persistence over time 	<ul style="list-style-type: none"> - It is not an organized phase - Poorly developed phase

TBI: traumatic brain injury; INAIL: Insurance against Accidents at Work; ADL: Activities of daily living; ICF: International Classification of Functioning, Disability, and Health.